

DEMATEL-Based Interpretive Structural Modeling for the Entrepreneur University among the Top Universities in the North Iran

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Abstract

Purpose: The present study aimed to present an interpretive structural model based on DEMATEL for the Entrepreneur University among top universities in the northern region of Iran.

Methodology: This study was applied in terms of objective and combined (qualitative and quantitative) in terms of implementation method. The research population in the qualitative section were documents and texts of the Entrepreneurship University and experts in this field that 35 documents and texts and 30 experts were selected as samples according to the principle of theoretical saturation by purposive sampling method. The research population in the quantitative section consisted of the same 30 experts who rated the components. The research tools included text review, semi-structured interview and 77-item researcher-made questionnaire that their psychometric indices were confirmed. Data were analyzed by Delphi methods and interpretive structural modeling based on DEMATEL in SPSS-23 and LISREL.

Findings: The results showed that the Entrepreneurship University included 77 concepts, 24 sub-components in 6 main components. So that among the 6 main components, three components of infrastructure (with four sub-components), management (with five sub-components) and communication with population (with four sub-components) were identified as effective variables and three components of services (with three sub-components), knowledge-based entrepreneurship (with five sub-components) and output and outcome (with three sub-components) were identified as affected variables. The results of DEMATEL-based interpretive structural modeling showed that in the first level with 10 components, the component of commercialization of knowledge and research and revenue generation from advanced technology, in the second level with 7 components, the component of entrepreneurial research, R&D and dissemination of academic results, in the third level with 14 components, the component of entrepreneurial research, R&D and dissemination of academic results, and in the fourth level with 1 component, the core component of strong leadership and change in structural and managerial dimensions were at a higher level.

Conclusion: According to the results of the present study, planners and higher education professionals can take advantage of the results of this study and plan for the improvement and growth of the Entrepreneur University through the effective components identified in it.

Keywords: University, Entrepreneur University, interpretive structural modeling

Introduction

Different communities are currently seeking to create an entrepreneurial revolution and become an entrepreneurial community. Iran is no exception and one of the main goals of the upstream documents and programs, especially the vision document of the Islamic Republic of Iran, is to transform the Iranian society into an innovative and entrepreneurial one in 2025 and benefit from the characteristics of third generation and entrepreneurial universities (Shoardebili, Rahmani and Vaisi, 2020). Entrepreneurship has recently become a social, economic and cultural issue. Because on the one hand, creating new jobs is necessary for the survival and economic dynamism of countries, and on the other hand, entrepreneurship increases social, economic and cultural efficiency (Eid, Badewi, Selim and El-Gohary, 2019). Entrepreneurship means commitment and acceptance, that is, a person takes the risk of starting a new business, and the Entrepreneur University has objectives as national and regional development and commercialization of knowledge and research (Ronstadt, Shuman and Vesper, 2021).

Entrepreneur universities are called third generation universities, because the first generation universities were initially education-oriented and their goal was to train specialized personnel, and the second generation universities were research-oriented and their goal was to research and produce science, but the third generation universities were entrepreneurs and their goal was to train entrepreneurial manpower connected with industry (Nunez and Marco, 2020). Entrepreneur University, as a center of advanced knowledge, contributes to economic and social development by carrying out its various missions and is an important accelerator of regional economic and social development. Because they have used knowledge as an opportunity for entrepreneurship, and accordingly, the role of universities is not only to produce knowledge and research, but also to disseminate knowledge to industry, community and entrepreneurship (Barnaby, Davins and Beech, 2021). Universities should no longer seek to generate human capital and labor to enter industry, but to become an important engine of sustainable technology development and economic growth (Fuster, Padilla-Melendez, Lockett and Del-Aguila-Obra, 2019). The emergence of entrepreneur universities is a response to the growing importance of knowledge in the national and regional system and innovation and new knowledge of the university. It is an institution that transfers knowledge and technology and is the source of creative inventions and is economical and cost-effective (Smith, Hamilton and Fabian, 2020). By improving their mechanisms, universities seek regional development and increase revenue generation, and act as natural growth centers by preparing the necessary support structures for faculty and students, continuously prepare them to create new businesses and commercialize intellectual property (Sidrat and Frikha, 2018). The Entrepreneur University has two tasks to perform. One is that it should train future entrepreneurs to create businesses and also develop the entrepreneurial spirit in students and all fields, and the other is that it should act entrepreneurially, organize growth centers and businesses, create science and technology parks etc., involve students in these organizations and help students and graduates to start a business and become financially independent (Chaudhary, 2017).

The university can be an entrepreneur in three ways. First, the university itself to act as an entrepreneurial unit. Second, university members, including professors, staff, and students can prepare themselves for entrepreneurship. Third, the interaction between university and industry creates a structure for entrepreneurship (Wakkee, Vander Sijde, Vaupell and Ghuman, 2019). Entrepreneur University represents universities that provide opportunities, practices, cultures and environments to encourage and accept the entrepreneurship of students and graduates. Creating academic entrepreneurship and innovation development in the university, presenting the results of academic research to the market, production and supply of new technologies and innovation expand the frontiers of knowledge. In fact, the Entrepreneur University is a response to the growing importance of knowledge, innovation, and wealth production and new perceptions of the university, which has affected the field of education and the university more than anything else (Ayed, 2020). Entrepreneur University as an organization in which all activities of members such as education and research are managed, administrated and executed in a way that the university is considered as an institution or quasi-economic company, that is, the activities of the university are oriented towards profitability and gaining competitive economic advantages. Based on this approach, the perspective

of the entrepreneur universities are important based on economic outputs such as patents, contracts, spawning companies, job creation and the mechanism of transferring science and technology to industry (Do and Dadvari, 2017). In knowledge-based economics, universities, in addition to their educational and research missions, have another mission called increasing participation in the process of innovation and technology development, and accordingly, universities have a role as an institution of production and distribution of knowledge and have a fundamental role in industrial innovation and technology development and job creation as entrepreneur universities (Lailatussaadah, Asyraf and Kadir, 2020). Relying on their two educational and research missions, universities are expected to pave the way for the application and exploitation of the capabilities created in graduates by creating knowledge-based businesses and to objectify the continuous growth of university, industry, government and other sectors of society in all areas (Ibidunni, Mozie and Ayeni, 2020).

Although relatively much research have been done on the components of the Entrepreneur University, little research has been done on its interpretive structural modeling based on DEMATEL. For example, Elyasi, Salehi and Uosefi (2021) while researching, considered the dimensions of the Entrepreneur University consisting of eighteen components in six dimensions of education and research (two components of education and research), structural and organizational (three components of structure, vision, mission, strategy, management and leadership), human resources (four components of professors, staff, students and graduates), cultural and social (two components of cultural and social), economic and financial (four components of economic, financial, facilities and equipment and research contracts) and information and communication technology (three components of infrastructure, offices and centers and companies). In another study, Tooshmali, Ali Mohammadzadeh, Maher, Hosseini and Bahadori (2020) considered that the components of Entrepreneur University included two main components: hardware (with four sub-components: creating a science and technology park, innovation, attracting financial resources, flexible organizational structure) and software (with six sub-components of quality of individuals' knowledge, entrepreneurial approach of university professors, entrepreneurial organizational culture, technological entrepreneurial management, policy-making and the text and content of courses). Akbari, Musavi and Esmaily Givi (2020), in a research, concluded that the Iranian Entrepreneur University has 20 components in 5 main categories: strategy and management, structure and processes, culture, educational system and network of interactions. So that the 5 components of leadership, entrepreneurial organization, resource management, entrepreneurial attitude and rules were the most importance. The results of Dalmarco, Hulsink and Blois (2018) showed that the components of Entrepreneur University include entrepreneurship education in the university, emphasis on applied research, having an entrepreneurial perspective, out-of-university relations or relations with industry, easy access to university resources such as laboratories, innovation structure and purposive research. In another study, Errasti, Bezanilla, Garcia-Olalla, Auzendi and Panos (2018) considered the entrepreneurial components as three contextual components (political, social conditions, demography, legal and administrative), resources (financial, infrastructure and human resources) and process (strategy and vision, procedures and policies, management team support, organizational design, formal entrepreneurship education, internationalization and active methodology). Giustina, Susana, Zilvinas and Karl (2017), in a research, considered the components of Entrepreneur University in two dimensions of goals (including social participation, knowledge and innovation transfer and continuing education) and actions (talent acquisition, continuing education for entrepreneurship competence, research network development, preservation of intellectual property and the formation of reproductive companies and participation in society and internationalization). In another study, Bahramchoobin, Moshref Javadi and Safari (2017) introduced the criteria of the Entrepreneur University to be financial resources (historical, diversity source, diverse and non-diverse budget and public and private source), human resources (faculty, research, etc., the core of autonomous and semi-autonomous command, relationship with industry, elected and appointed leadership and students), structure (size, transfer structure such as science and technology parks, etc. and legal form including public, private, etc.), tangible factors (infrastructure, research contract, patent, location, technology, training courses, journals, conferences, trade union activities, course content

and alumni community activities) and intangibles (strategic focus, reward system, entrepreneurial plans, reputation, networks and human resource management such as faculty).

In our country, most universities are in the second generation of universities, i.e. research-oriented ones, and are not so active in commercializing research findings, training entrepreneurs and becoming the third generation of universities, i.e. entrepreneur universities. The commercialization activities of domestic universities are often limited to the creation of science and technology parks that have little output to the business market. Therefore, it is necessary to create innovative activities through the creation of entrepreneur universities. Because without access to such universities, the results of scientific research have no destiny other than being stored in academic repositories and libraries, which rarely turn into innovative activities, products and services and most studies have identified its components and examined some of the relationships between concepts (Behzadi, Razavi and Hosseini, 2015). Another important point is that relatively much research has been done on the components of the Entrepreneur University, but few studies have examined its interpretive structural modeling and no DEMATEL-based research has been found. In addition, on the one hand, the world is currently witnessing extensive and rapid changes in the social, economic and cultural spheres, and increasing competition, lack of resources and increasing knowledge-based economy has provided new conditions and environment for society and the university and on the other hand, today, the issue of entrepreneurship and Entrepreneur University has become one of the most important and hot topics in the field of strategic management of the country. According to the issues presented, the present study was conducted to model a DEMATEL-based interpretive structure for the Entrepreneur University among the selected universities in the northern region of Iran.

Methodology

This study was applied in terms of purpose and mixed (qualitative and quantitative) in terms of implementation. The research population in the qualitative section were documents and texts of the Entrepreneur University and experts in this field that 35 documents and texts and 30 experts were selected as a sample according to the principle of theoretical saturation by purposive sampling method. The population of the first section consisted of 100 articles, 10 dissertations and 5 books after reviewing various sources. After studying them and reviewing the research questions and objectives, 35 items including 30 articles, 4 dissertations and 1 book were selected to extract information about the Entrepreneur University. The population of the second part included experts from the northern region of Iran, including Golestan, Mazandaran and Guilan universities, numbering 85 people. According to the inclusion criteria, including supporting the knowledge-based business, job creation and having a background in entrepreneurship, such as establishing industry liaison offices and institutions of the entrepreneurship center, growth center, science and technology park and university companies, 30 of them were selected by purposive sampling method. The research population consisted of the same 30 experts who rated the components. The purpose of the purposive sampling method is to select documents, texts, and experts who can provide maximum assistance to the researcher and convey maximum information.

The research process was as follows: first, with the help of professors, the documents and texts of Entrepreneur University were reviewed, and after reviewing the objectives, some questions and general contents were selected for full review and then some experts were selected for interviews. All selected documents and texts were reviewed in terms of concepts related to the Entrepreneur University and interviews with experts were conducted based on questions that were reviewed with the help of professors and theoretical foundations. The importance and necessity of the research was stated for the interviewees and they were reassured about the observance of ethical points. Also, before the interview, they agreed to the interview and were told that in addition to taking notes of the interviews, their voices would be recorded so that some of the information would not be lost. The average interview time with each person was about 40 to 50 minutes. Based on the review of documents, texts and interviews, the contents were collected and concepts and components were extracted. In the quantitative section, the same experts in the qualitative section were asked to rate the identified components of the researcher-made 77-item questionnaire, which was scored on a ten-point Likert scale from one to ten.

The research tools included text review, semi-structured interviews with experts whose validity of the interview was confirmed by the triangulation method and its reliability was estimated to be 0.79 by the inter-coder reliability. Other tools of this study included a researcher-made questionnaire whose content validity was confirmed by experts and its reliability was 0.95 with Cronbach's alpha method and 0.97 with mixed method. Therefore, for data collection, desk studies were used in the form of taking notes and field studies in the form of semi-structured interviews and researcher-made questionnaires. Finally, the data were analyzed by Delphi methods and interpretive structural modeling based on DEMATEL in SPSS-23 and LISREL-20. The DEMATEL technique is a comprehensive method for constructing, analyzing a structural model involving cause-and-effect relationships between complex factors, which is a very useful scientific tool for discovering cause-and-effect relationships.

Findings

The main and secondary concepts and components for the Entrepreneur University model among selected universities in the northern region of Iran were presented in Table 1.

Table 1. Concepts and main and sub-components for the Entrepreneur University among the selected universities in the northern region of Iran

Concept No.	Sub-components	Main components
14	1. Economic, cultural, social, political and technological contexts, 2. Development of applied courses and entrepreneurial education, 3. Development of university entrepreneurship education and innovative learning, and 4. Welcoming creative ideas and rewards for innovation	Infrastructure
16	1. Strong core of leadership and change in structural and managerial dimensions, 2. Common vision and forward-looking strategy, 3. Entrepreneurial management and culture, 4. Existence of university policy and governance about entrepreneurship and 5. Strong entrepreneurial vision and development of business spirit and behavior	Management
15	1. Development of structural boundaries and internationalization, 2. Communication with society and venture investment with industries, 3. Supportive policies and regulations and innovation networks, and 4. Diversification of revenue sources and funding of research	Communication with the community
9	1. Supporting and creating a knowledge-based business and creating a wealth of knowledge, 2. Entrepreneurial partnership between management and university members in a flexible structure, and 3. Entrepreneurial research, R&D, and dissemination of academic results.	Services
12	1. Strong academic core and faculty and creative and innovative staff, 2. Entrepreneurial organizational structure, risk-taking and ethical principles, 3. Knowledge-based entrepreneurship in the entrepreneurial ecosystem and job creation, 4. Establishment of growth center institutions, science and technology park and academic companies and 5. Mechanisms and financial requirements in attracting resources from entrepreneurial activities	Knowledge-based entrepreneurship
11	1. Commercialization of knowledge and research and generation of revenue from advanced technology, 2. Development of academic entrepreneurship and support for innovation and creativity processes, and 3. Providing entrepreneurial achievements and support for entrepreneurial teams and members.	Output and consequence

According to the results of Table 1, the Entrepreneur University model among the selected universities in the northern region of Iran has 77 concepts, 24 sub-components in 6 main components including infrastructure (with four sub-components), management (with five sub-components), community relations (with four sub-components), services (with three sub-components), knowledge-based entrepreneurship (with five sub-components) and output and outcome (with three sub-components). Cause-and-effect relationships of DEMATEL-based interpretive structural modeling for the main components of the Entrepreneur University among the selected universities in the northern region of Iran are presented in Figure 1.

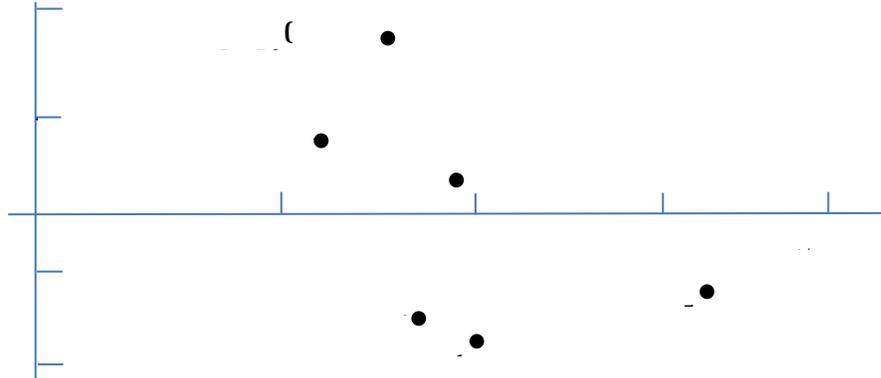


Figure 1. Cause and effect relationships for the main components of the Entrepreneur University among the selected universities in the northern region of Iran

According to the results of Figure 1, among the 6 main components, three components are infrastructure (A1), management (A2) and community relations (A3) as effective variables and three components of services (A4), knowledge-based entrepreneurship (A5) and output and outcome (A6) were identified as affecting variables for the Entrepreneur University model among the selected universities in the northern region of Iran. Therefore, the conceptual model of Entrepreneur University among the selected universities in the northern region of Iran is presented in Figure 2.

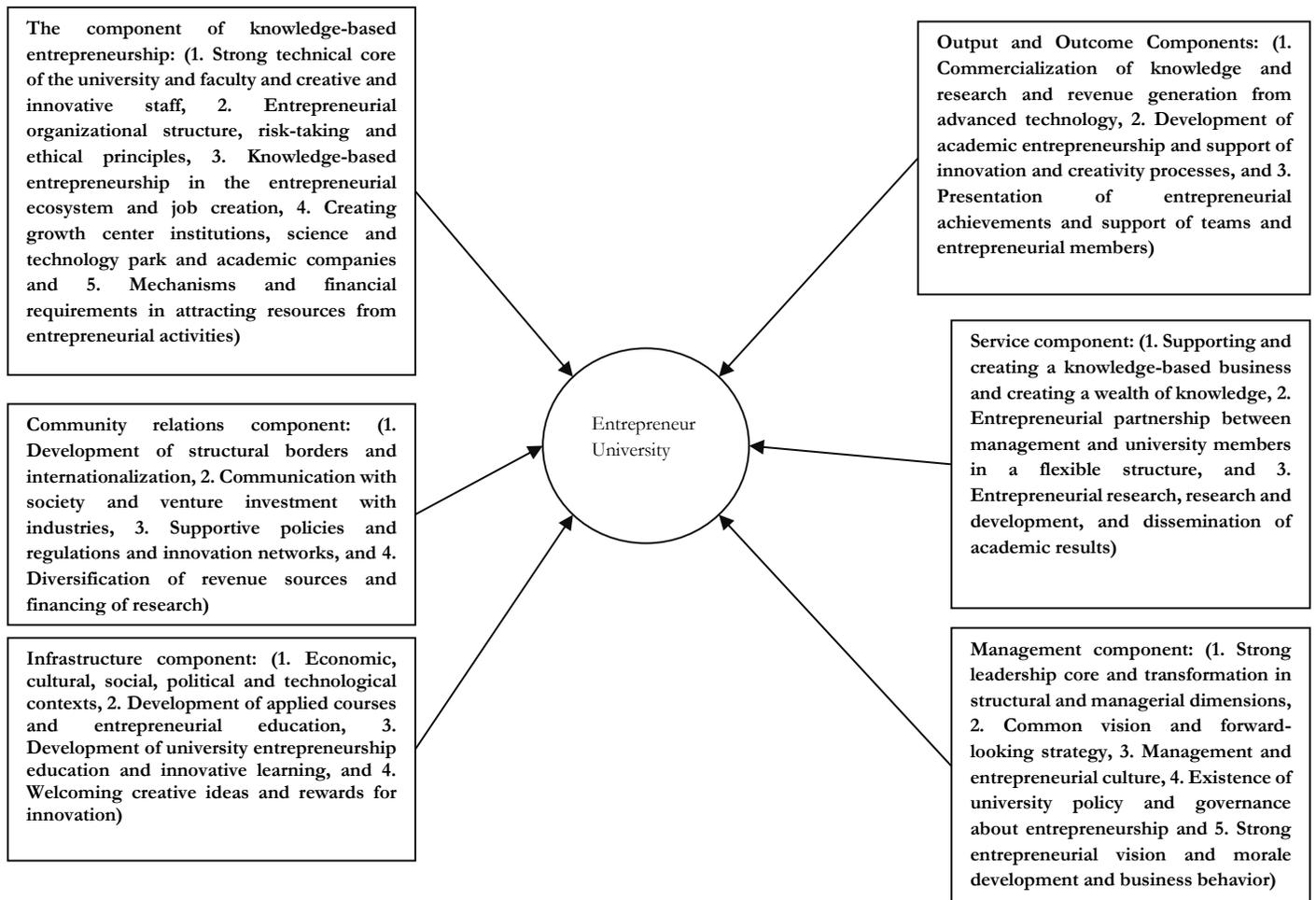


Figure 2. Conceptual model of Entrepreneur University among the selected universities in the northern region of Iran

According to the results of Figure 2, among the 6 main components of the Entrepreneur University model among the selected universities in the northern region of Iran, three components of infrastructure (with four sub-components), management (with five sub-components) and community relations (with four sub-components) were identified as effective variables and three components of services (with three sub-components), knowledge-based entrepreneurship (with five sub-components) and output and outcome (with three sub-components) were identified as affected variables. As a result, the final model of Entrepreneur University among the selected universities in the northern region of Iran is presented in Figure 3.

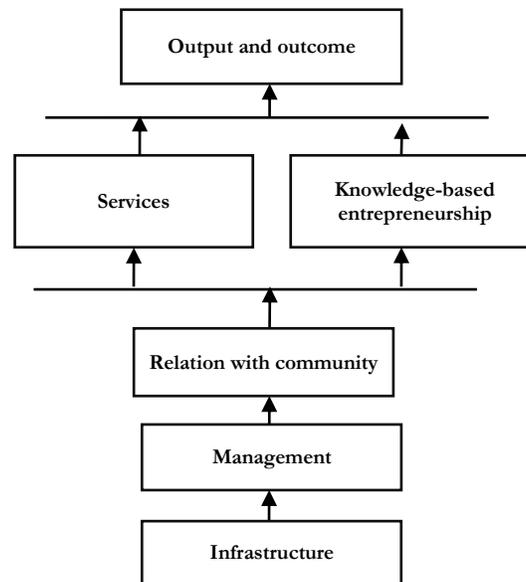


Figure 3. The final model of Entrepreneur University among selected universities in the northern region of Iran

DEMATEL-based interpretive structural modeling leveling for the sub-components of the Entrepreneur University model among the selected universities in the northern region of Iran was presented in Table 2.

Table 2. Leveling of sub-components of the Entrepreneur University model among the selected universities in the northern region of Iran

Rank	Component	Level
1	Commercialization of knowledge and research and generation of revenue from advanced technology	
2	Supporting and creating a knowledge-based business and creating a wealth of knowledge	
3	Providing entrepreneurial achievements and supporting entrepreneurial teams and members	
5	Developing university entrepreneurship and supporting innovation and creativity processes	
7	Connecting with community and making venture investments with industries	Level 1
8	Welcoming creative ideas and rewarding innovation	
10	Development of structural borders and internationalization	
13	Knowledge-based entrepreneurship in the entrepreneurship ecosystem and job creation	
14	Establishment of institutions of growth center, science and technology park and university companies	
16	Financial mechanisms and requirements in attracting resources from entrepreneurial activities	
4	Entrepreneurial research, R&D and dissemination of academic results	
11	Development of university entrepreneurship education and innovative learning	Level 2
17	Developing practical lessons and entrepreneurial education	

18	Strong academic core and faculty and creative and innovative staff	
19	Entrepreneurial management and culture	
20	Entrepreneurial organizational structure, risk-taking and ethical principles	
24	Entrepreneurial partnership between management and university members in a flexible structure	
4	Entrepreneurial research, R&D and dissemination of academic results	
6	Strong entrepreneurial vision and development of business spirit and behavior	
9	Diversifying revenue sources and providing research funding	
11	Development of university entrepreneurship education and innovative learning	
12	Supportive policies and regulations and innovation networks	
13	Knowledge-based entrepreneurship in the entrepreneurship ecosystem and job creation	
15	Economic, cultural, social, political and technological contexts	Level 3
17	Developing practical lessons and entrepreneurial education	
18	Strong academic core and faculty and creative and innovative staff	
19	Entrepreneurial management and culture	
20	Entrepreneurial organizational structure, risk-taking and ethical principles	
21	Common vision and forward-looking strategy	
22	Existence of university policy and governance about entrepreneurship	
24	Entrepreneurial partnership between management and university members in a flexible structure	
23	The core of strong leadership and change in structural and managerial dimensions	Level 4

According to the results of Table 2, DEMATEL-based interpretive structural modeling for the sub-components of the Entrepreneur University model among the selected universities in the northern region of Iran showed that in the first level with 10 components, the component of commercialization of knowledge and research and revenue generation from advanced technology, in the second level with 7 component, component of entrepreneurial research, R&D and dissemination of academic results, in the third level with 14 components, component of entrepreneurial research, R&D and dissemination of academic results, and in the fourth level, 1 component, core leadership component, change in structural and managerial dimensions were at a higher level.

Conclusion

Entrepreneur University can play an effective role in economic prosperity and improving the social, political and cultural situation of society. As a result, the present study aimed to model a DEMATEL-based interpretive structure for the Entrepreneur University model among the selected universities in the northern region of Iran.

In the present study, the results showed that the Entrepreneur University had 24 sub-components in 6 main components, so that among the 6 main components, three components of infrastructure (with four sub-components), management (with five sub-components) and communication with society (with four sub-components) were identified as effective variables and three components of services (with three sub-components), knowledge-based entrepreneurship (with five sub-components) and output and outcome (with three sub-components) were identified as affected variables. Other results showed that in the first level with 10 components, the component of commercialization of knowledge and research and income generation from advanced technology, in the second level with 7 components, the component of entrepreneurial

research, R&D and dissemination of academic results, in the third level with 14 components, the component of entrepreneurial research, R&D and dissemination of academic results and in the fourth level 1 component, the core component of strong leadership and change in structural and managerial dimensions were at a higher level. These results were in line with the results of Elyasi et al. (2021), Tooshmali et al. (2020), Akbari et al. (2020), Dalmarco et al. (2018), Errasti et al. (2018), Giustina et al. (2017) and Bahramchoobin et al., (2017). In explaining these results, it can be said that the transformation of selected universities into entrepreneurial ones in addition to positive consequences in the field of innovation development, increasing welfare, technology, job creation and contributing to regional and national economic growth can act as a sustainable revenue source and mechanism for universities and free them from dependence on government budgets. According to the results of this study, the center of change for entrepreneurship in selected universities is cultural architecture and knowledge-based innovative entrepreneurial activities. According to the explanation of entrepreneurial characteristics of universities, it can be said that due to the great influence of components and concepts of Entrepreneur University in the designed model, selected universities can make more efforts to crystallize entrepreneurial characteristics and develop the university's relationship with other universities and research centers and industries. To become an entrepreneur, universities must pay special attention to their infrastructures such as economic, cultural, social, political and technological contexts, formulating applied courses and entrepreneurial education, developing university entrepreneurship education and innovative learning, and welcoming creative ideas and rewards for innovation and through characteristics such as strong leadership core and transformation in structural and managerial dimensions, common vision and forward-looking strategy, entrepreneurial management and culture, existence of university policy and governance on entrepreneurship and strong entrepreneurial vision and development of business spirit and behavior, pave the ground for improving communication with society by developing the structural boundaries and internationalization, communication with society and venture investment in industries, supportive policies and regulations, and innovation networks and financial source diversification and funding research.

Selected universities can take effective and fundamental steps to becoming Entrepreneur Universities according to the desired characteristics in the dimension of Entrepreneur University services such as supporting and creating knowledge-based businesses and creating wealth through knowledge, entrepreneurial partnership between management and university members in a flexible structure and entrepreneurial research, R&D and dissemination of academic results. In the component of knowledge-based entrepreneurship, selected universities can promote to an Entrepreneur University by considering the characteristics of an Entrepreneur University such as strong academic technical core, and faculty and innovative and creative members, the entrepreneurial organizational structure, risk-taking and ethical principles, knowledge-based entrepreneurship in the entrepreneurial ecosystem, job creation, establishing institutions for growth centers, science and technology parks, and academic companies and financials mechanisms and requirements. According to the characteristics of the Entrepreneur University, such as developing the spirit and tendency to entrepreneurial activities of university members, commercialization of university knowledge, research and technology, and university entrepreneurship development, they should pave the way for universities to become Entrepreneur Universities. Considering the output and outcomes of Entrepreneur University such as commercialization of knowledge and research and generating income from advanced technology, development of university entrepreneurship and supporting innovation and creativity processes and providing entrepreneurial achievements and supporting teams and entrepreneurial members of universities, they should make maximum effort and perseverance. The results of the present study proved that the issue of employment in Iran is a complex and multidimensional issue, however, a systematic and macro-strategic approach to the issue of Entrepreneur University can solve the problem of unemployment. According to successful businessmen of leading entrepreneur universities in developed countries, it can be said that Entrepreneur University can solve the employment problem through knowledge-based mechanisms, but it has been neglected or has received less attention in Iran.

The present study faced some limitations, the most important of which were the few studies and researches in Iran and world about the Entrepreneur University and the relatively little information of experts about the

Entrepreneur University. Another limitation was the limitation of the research community to selected universities in the northern region of Iran, including the universities of Golestan, Mazandaran and Guilan, therefore, doing more research about the Entrepreneur University and examining it from different aspects could be of great help to specialists and planners in designing applications. Another research proposal was to perform or repeat the present study on DEMATEL-based interpretive structural modeling or other models for the Entrepreneur University on universities in other regions and compare their results with the results of the present study. According to the results of the present study, planners and higher education professionals can take advantage of the results of this study and plan for the improvement and growth of the Entrepreneur University through the effective components identified in it. Therefore, teaching entrepreneurial skills to faculty members, staff and students was essential and it was recommended that entrepreneurship skills courses be held for all of them and even specialists and curriculum planners are recommended to include mandatory entrepreneurship courses for students of all fields of study and use the results of this and other research as an entrepreneurship lesson. Another practical proposal is to encourage faculty members, staff and students to establish academic centers and companies, growth centers, science and technology parks and job creation according to the existing potentials through incentive programs and their material and spiritual support by universities and other government institutions.

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